The ability of the pre-admission criteria to predict performance in a Saudi medical school

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ABSTRACT

الأهداف: تقييم قدرة ودقة معايير القبول المستخدمة في معظم الكليات الصحية في السعودية على توقع الأداء للطلاب في تلك الكليات.

الطريقة: أجريت دراسة استعادية في كلية الطب مدينة الملك فهد الطبية – كلية الطب خلال الفترة من يوليو 2008م حتى سبتمبر 2008م. استخدمت 4 مجاميع لدراسة القدرة التنبئية لمعايير القبول. وهذه المتغيرات هي المعدل الأكاديمي (درجة الثانوية العامة)، واختبار الذكاء، والاختبار التحصيلي، والمقابلة الشخصية. استخدم المعدل التراكمي للطلاب (GPAs) للحكم على أداء الطالب في المرحلة الجامعية (عدد = 193). تم تحديد العلاقة بين معايير القبول، وأداء الطلاب باستخدام معامل الارتباط بيرسون، و تحليلات الانحدار.

النتائج: كشفت كل أدوات القبول الأربع المدرجة في تحليل الانحدار أن المعيار الوحيد المناسب للتنبؤ بالأداء كان الاختبار التحصيلي. بينما سجل التطابق بين المعايير الحالية ومعدل الطالب الجامعي (GPA) نسبة لم تتجاوز 6.5% فقط.

خاتمة: توفر معايير القبول الحالية بعض الدلالات على توقع مستقبل أداء الطلاب. ويوصى باستخدام أدوات أكثر دقة ومصداقية مثل المقابلات المصغرة المتعددة، والاستبيان المحدد لملائمة تمازج الطالب مع طرق التعليم الطبي الحديثة وغيرها.

Objectives: To evaluate the ability of preadmission criteria used in most health professional schools in Saudi Arabia to predict the in-program performance.

Methods: This retrospective cohort study was conducted at King Fahd Medical City, Faculty of Medicine, Riyadh, Kingdom of Saudi Arabia between July and September 2008. Four sets were used to examine the predictive power of preadmission variables. The variables are the academic abilities (high school grades), aptitude test, achievement test, and an interview. The criterion variables were the undergraduate grade point averages' (GPAs) of medical college students (n=193). The correlation between admission variables and the GPA was examined using Pearson's correlation coefficient and regression analyses.

Results: Inclusion of all 4 admission tools in a regression analysis as predictors of GPA performance revealed that only the achievement test was statistically predictive of the GPA. Approximately 6.5% of variance in the GPA can be accounted for by the current admission criteria.

Conclusions: The current admission criteria provide some insight into the predicted future performance of students. The inclusion of other valid and reliable admissions tools, such as the multiple mini-interviews and the questionnaire for candidate's suitability to follow a problem-based learning curriculum, should be considered.

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In many countries, health care professionals enjoy a privileged status, which makes entry to health colleges highly competitive. Selecting the 'right' students is a challenge for medical schools and a subject of debate worldwide. Factors of non-academic criteria are being considered, such as excellent interpersonal skills, evidence of compassion and concern for others, maturity, and a well-informed motivation for medicine. These qualities

are expected to enable students to cope with the rigors of the health course and become globally competent practicing doctors.[1] The growing pool of candidates with high academic scores is increasing. Therefore, the admission system should strive to use selection criteria that are able to predict performance in the program. The admission criteria used to select medical students worldwide varies. In the United Kingdom, there is some commonality across medical colleges regarding the criteria used to select future doctors. Attributes such as academic ability coupled with a 'well rounded' personality demonstrated by motivation for medicine, extracurricular interests, and experience of teamwork and leadership skills are considered.[2] In other European countries, there is even greater heterogeneity, for instance, in the Netherlands, Dutch medical schools may select a proportion of the candidates via interview and other methods, but the remaining candidates are identified through a lottery among high school graduates weighted for academic attainment. The heterogeneity in the selection processes exists both between and within countries.[3] In the United States, requirements for admission to medical colleges vary from school to school. The requirements include minimum academic levels (indicated by undergraduate grade point averages [GPA] and performance in the medical college admissions test [MCAT]). Most of the colleges conduct well-structured and validated interviews to identify one or more of a range of non-academic characteristics. These interviews may last up to 90 minutes in some of the universities. A similar approach to selection is seen among the 17 Canadian medical colleges.[1] There has been a growing acknowledgment for some years towards the non-academic personal qualities. They have been found to be just as important and influential to the learning and practice of medicine as academic ability.[4] The University of Adelaide, Australia, conducted extensive examination of empirical evidence of the selection process of medical students. They adopted a national written examination of reasoning and interaction skills, a structured oral assessment, and a threshold matriculation score.[5] A review of the predicators of good and poor performance for medical students can assist universities in setting better admission systems. Several studies in the United States report extensive validation of their admission criteria. One study reports a comprehensive summary of the relationships between GPAs and MCAT scores on one hand and medical school grades, United States Medical Licensing Examination (USMLE) step scores, and academic distinction or difficulty on the other.[6] In the recent past, admission to the Saudi Health Colleges depended only on academic ability, namely, high school passing grade, which should be more than, or equal to 90%. In 2001, it was decided by the Ministry of Higher Education to add more valid and reliable selection criteria. The current admission criteria have been unified for almost all health colleges (Medical, Dental, Pharmacy, and Applied Medical Science) in Saudi universities. The 4 main components currently used as the selection criteria for health colleges are academic ability, aptitude test, achievement test, and a semi-structured interview. The academic ability implies that all applicants should fulfill the high school passing grade of 90% or more. This is the main and mandatory condition, which accounts for 20-30% of the weight in different medical schools. The 'aptitude test,' which tests the deeper understanding of the given reading materials and some mathematic problem-solving abilities in the form of multiple choice questions (MCQs), accounts for 30% of the weight. This part of the exam is conducted biannually.[7] The 'achievement test' assesses the accumulative scientific knowledge of the 3 years high school scientific subjects (chemistry, biology, physics, and mathematics,) and English. The test consists of MCQs and represents 30-40% of the weight. The aptitude test and the achievement test are conducted centrally under the supervision of the National Center for Assessment in Higher Education. Decisions regarding students are reached on the sum of these written examinations, which are mainly based on the cognitive abilities of the candidate.[8,9] The last component is a semi-structured interview. The interview focuses on personal attributes and attitudes of an applicant. It is conducted by a panel of 3 interviewers for 20 minutes. It may exclude around 5-10% of the candidates already chosen for the interview from the first 3 items. This interview is resource-intensive and expensive. The university to which the candidate has applied conducts the interview and admit candidates individually. The aim of this study is to evaluate the ability of the preadmission criteria used at King Fahad Medical City (KFMC), Faculty of Medicine, Riyadh, Kingdom of Saudi Arabia to predict in-program performance. Furthermore, the study aims to identify predictors of good and poor performance.

Methods. This retrospective cohort study was conducted in the undergraduate medical curriculum at KFMC between July and September 2008. The study was approved ethically by the Institutional Review Board (IRB-09/117). The KFMC adapts a 6-year hybrid problem based learning (PBL) curriculum in which the first year is a premedical year. The admission criteria consist of 4 components. To examine the predictive power of different combinations of preadmission variables, 4 predictor sets were used and given a specific weight according to the admission criteria at KFMC. The variables and the given weight for each are as follows, the academic abilities (20%), aptitude test (30%),

achievement test (40%) and a semi-structured interview (10%). A brief description of the variables used in the study follows. Student GPA: For each medical student, an end-of-year GPA was created by multiplying each course grade by the number of credit hours for that course, then dividing this sum by the total number of credit hours for that student. The resulting averages were converted to a common 5.0 scale. Students with a GPA<3 were considered poor performers. A GPA<3 is anticipated as a pass with the least acceptable score. Admission total score: This score is a sum of the 4 preadmission variables. Each variable is given a specific weight as described earlier, and the total is 1000.

All the students currently enrolled at KFMC medical faculty were included in this study. The medical faculty at present has 4 batches of students, year one to the end of year 4. The criterion variables were the GPAs of medical college students currently enrolled at KFMC. All 4 years were analyzed together as the admission parameters were unified with specific weight given to each variable. The correlation between admission variables and the GPA was examined using Pearson's correlation coefficient, and regression analyses, to determine the nature and strength of relationships among the variables of interest. Furthermore, a multiple regression analysis was conducted for poor performers with GPA<3, to evaluate how the admissions tools predict the poor performance during the program. The *p*-value was considered significant at <0.05. The data obtained was analyzed using Statistical Package for Social Sciences (SPSS 12.0 version).

Results. The total number of students included in this study was 193. Most students were male (87%), with female students representing 13%, as only one batch of female students was available at the time of the study (**Table 1**). According to the admission total score of 1000, 7% of the students scored 600-699, 60% scored 700-799, and 33% scored in the range of 800-899. **Table 2** illustrates the correlation between each admission tool and the GPA of the students. A multiple regression analysis was conducted to evaluate how the 4 predictors predict performance during the program, and the criterion variable was GPA. The current admission tools can account for approximately 6.5% of variance in GPA. Inclusion of all 4 admissions tools in a regression analysis as predictors of GPA performance revealed that only the achievement test was statistically predictive of the GPA (β=0.20, *p*=0.01). **Table 3** illustrates the correlation between each admission tool and GPA for poor performers (GPA<3). Inclusion of all 4 admissions tools in a regression analysis as predictors of GPA

Table 1 - Student characteristics and descriptive statistics (n=193, male/female = 167/26).

GPA	<2		2 - <3		3-4		>4		Total (%)
	Male	Female	Male	Female	Male	Female	Male	Female	
Year 1	10	0	23	2	11	16	17	8	**87 (45)**
Year 2	8	-	15	-	6	-	5	-	**34 (18)**
Year 3	1	-	15	-	18	-	11	-	**45 (23)**
Year 4	0	-	4	-	8	-	15	-	**27 (14)**
Sum	19	0	57	2	43	16	48	8	**193**
Total (%)	**19 (10)**		**56 (30.5)**		**56 (29)**		**59 (30.5)**		

Table 2 - Uncorrected correlations between admissions tools and grade point average (GPA) and standardized coefficients (β).

Admissions tool	GPA			
	Correlation	*P*-value	β	*P*-value
Academic abilities	0.14*	0.03	0.10	0.08
Aptitude test	0.11	0.07	0.00	0.12
Achievement test	0.22*	0.02	0.20*	0.01
Interview	0.08	0.10	0.05	0.09
Admission total score	0.23*	0.04	-	

*p<0.05, β – Indicates the ability of each admissions tool to predict the GPA

Table 3 - Uncorrected correlations between admissions tools and grade point average (GPA) and standardized coefficients (β) in poor performers with GPA <3.

Admissions tool	GPA			
	Correlation	*P*-value	β	*P*-value
Academic abilities	0.24*	0.04	0.20	0.9
Aptitude test	0.19	0.13	0.09	0.21
Achievement test	0.22*	0.02	0.17	0.10
Interview	-0.10	0.25	-0.14	0.17
Admission total score	0.22	0.08	-	

*p<0.05, β – Indicates the ability of each admissions tool to predict the GPA

performance in poor performers was performed. It revealed that the model was not significantly predictive of poor performance ($p>0.05$). The current admission tools can account for approximately 12% of variance in the GPA of poor performers.

Discussion. The aim of this study was to evaluate the ability of preadmission criteria used in KFMC and in other health professional schools in Saudi Arabia to predict the in-program performance. The admission criteria currently applied were analyzed in this study using the GPA as an indicator of performance. The current admission tools could not explain more than 6.5% of the variance in GPA. There are other factors not recognized in the current admission criteria that can explain the variance in GPA. These factors could be academic or non-academic attributes. It is interesting to note that the achievement test was the main statistically predictive factor of performance during the undergraduate medical program. The significant correlation between the academic abilities and the achievement test with the GPA supports the cognitive nature of these admission tools. On the contrary, the academic abilities (high school percentage) were not statistically predictive of performance. This raises a major concern as this is the only strict admissions tool that has a minimum requirement of at least 90%. Applicants with a high school percentage below 90% are strictly not considered for admission to medical schools. Probably because high school marks are on subjects not directly relevant to medicine. This finding supports the approach of some European countries in not considering the high school percentage as a main admission tool.[3]

The most disconcerting finding in this study was the negative correlation and negative predictive value between the interview and the GPA in poor performers. The scores were not significant, but still raises an issue on the reliability of this tool. The results of this study support the results found in previous similar studies.[10,11] The lack of correlation between the traditional interview and the academic performance was observed. The most important purpose of the interview is to gather non-academic information on candidates that would be difficult or impossible to obtain by other means. An innovated protocol, the multiple mini-interview has been proposed and shown to be feasible, acceptable, and a reliable method to assess personal qualities of a candidate.[12,13] Reliability and validity has been shown to be higher in structured medical admissions interviews as compared with unstructured and individual interviews.[14,15] Psychometric tests have been used to measure personality characteristics and abilities rather than learned material.[16-18] In an attempt to gain insight into the indicators of poor performance, the poor performers with GPA<3 were studied separately. Two of the admissions tools correlated significantly with poor performance. Low scores in the academic abilities and achievement test correlated with poor performance.

Nevertheless, there are some limitations in this study that need to be mentioned. First, a limited number of students were analyzed in this study. Also, only one undergraduate medical school was considered. A nationwide analysis would provide stronger evidence to judge the current admissions tools. Secondly, the GPA evaluated the performance in the medical school. This does not distinct between the cognitive and non-cognitive characteristics. Further studies should correlate the admissions tools to specific performance in cognitive and non-cognitive assessments. Finally, although this study was carried out in one medical school it provides an insight on current practice and highlights points that need to be further studied.

From this study, it can be concluded that the current admission criteria provide some insight into the predicted future performance of students. These tools need to be further investigated and evaluated. Furthermore, the inclusion of valid and reliable admissions tools, such as the multiple mini-interview,[12,13] and the questionnaire for candidate's suitability to follow a PBL curriculum, could be considered.[16,19]

References

1. Albanese MA, Snow MH, Skochelak SE, Huggett KN, Farrell PM. Assessing personal qualities in medical school admissions. ***Acad Med*** 2003; 78: 313-321.
2. Parry J, Mathers J, Stevens A, Parsons A, Lilford R, Spurgeon P, et al. Admissions processes for five year medical courses at English schools: review. ***BMJ*** 2006; 332: 1005-1009.
3. Coebergh J. Dutch medical schools abandon selection for lottery system for places. ***Student BMJ*** 2003; 11: 138.
4. Searle J, McHarg J. Selection for medical school: just pick the right students and the rest is easy! ***Med Educ*** 2003; 37: 458-463.
5. Turnbull D, Buckley P, Robinson JS, Mather G, Leahy C, Marley J. Increasing the evidence base for selection for undergraduate medicine: four case studies investigating process and interim outcomes. ***Med Educ*** 2003; 37: 1115-1120.
6. Julian ER. Validity of the Medical College Admission Test for predicting medical school performance. ***Acad Med*** 2005; 80: 910-917.
7. National Center for Assessment in Higher Education. The Aptitude Test (Online). [updated 2007 December, cited 2008 July 20] Available from URL: http://www.qeyas.com/Qiyas/info/Default.aspx
8. The Achievement Test (Online). [updated 2007 December, cited 2008 July 22]. Available from URL: http://www.qiyas.org/Qiyas/Exams/TahseelySExams.aspx

9. Abdulghani HM. Admission criteria for Saudi Health Colleges: The current status and a literature review. ***Medical Channel*** 2009; 15: 18-21.
10. Basco WT Jr, Gilbert GE, Chessman AW, Blue AV. The ability of a medical school admission process to predict clinical performance and patients' satisfaction. ***Acad Med*** 2000; 75: 743-747.
11. Huda N, Dosa TI, Alam E, Agha S. Selection procedure as predictor of performance in university examination. ***J Pak Med Assoc*** 2001; 51: 381-384.
12. Eva KW, Reiter HI, Rosenfeld J, Norman GR. The ability of the multiple mini-interview to predict preclerkship performance in medical school. ***Acad Med*** 2004; 79 (Suppl 10): S40-S42.
13. Roberts C, Zoanetti N, Rothnie I. Validating a multiple mini-interview question bank assessing entry-level reasoning skills in candidates for graduate-entry medicine and dentistry programmes. ***Med Educ*** 2009; 43: 350-359.
14. Ann Courneya C, Wright K, Frinton V, Mak E, Schulzer M, Pachev G. Medical student selection: choice of a semi-structured panel interview or an unstructured one-on-one interview. ***Med Teach*** 2005; 27: 499-503.
15. Powis DA, Neame RL, Bristow T, Murphy LB. The objective structured interview for medical student selection. ***Br Med J (Clin Res Ed)*** 1988; 296: 765-768.
16. Bore M, Munro D, Kerridge I, Powis D. Not moral "reasoning": A Libertarian-Communitarian dimension of moral orientation and Schwartz's value types. ***Aust J Psychol*** 2005; 57: 38-48.
17. Munro D, Bore MR, Powis DA. Personality factors in professional ethical behaviour: studies of empathy and narcissism. ***Aust J Psychol*** 2005; 57: 49-60.
18. Powis D, Bore M, Munro D, Kerridge I, Sze D. Personal Qualities Assessment (PQA). [Updated 2003, cited 2008 July 21]. Available from URL: http://www.pqa.net.au/
19. Chamberlain SE, Searle J. Assessing suitability for a problem-based learning curriculum: evaluating a new student selection instrument. ***Med Educ*** 2005; 39: 250-257.

Ethical Consent

All manuscripts reporting the results of experimental investigations involving human subjects should include a statement confirming that informed consent was obtained from each subject or subject's guardian, after receiving approval of the experimental protocol by a local human ethics committee, or institutional review board. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.